WHAT IS CLAIMED IS:

1. A cleaning apparatus comprising:

a transfer chamber into which a substrate to be cleaned is loaded;

a first cleaning chamber connected to the transfer chamber so that a substrate can be transferred between said transfer chamber and said first cleaning chamber;

a reactant supplier that supplies a fluid comprising a reactant, capable of chemically removing contaminants from the surface of the substrate, into said first cleaning chamber, said reactant supplier being oriented to direct the fluid onto the surface of a substrate transferred into the first cleaning chamber;

a light source that irradiates the surface of a substrate transferred into the first cleaning chamber to supply activation energy required to cause a chemical reaction between the reactant and contaminants on the surface of the substrate;

a second cleaning chamber connected to the transfer chamber independently of the first cleaning chamber such that a substrate can be sequentially transferred between said first and second cleaning chambers via said transfer chamber;

an aerosol supplier that supplies an aerosol into said second cleaning chamber, said aerosol supplier comprising an aerosol-generating nozzle oriented to direct the aerosol onto the surface of a substrate transferred into the second cleaning chamber, and a heat exchanger that freezes gas particles of the aerosol upstream of the aerosol-generating nozzle, whereby frozen

particles are jetted into said second cleaning chamber through said aerosol-generating nozzle to physically remove contaminants from the surface of the substrate transferred into the second cleaning chamber.

2. The cleaning apparatus of claim 1, wherein said light source is an ultraviolet lamp.

3. The cleaning apparatus of claim 2, wherein said ultraviolet lamp generates UV light having a wavelength selected from the group consisting of about 184.9 nm and about 253.7 nm.

4. The cleaning apparatus of claim 1, wherein said light source is an infrared light source.

5. The cleaning apparatus of claim 1, wherein said light source is disposed outside said first cleaning chamber, and one wall of the first cleaning chamber comprises a window through which the light propagates towards the surface of the substrate.

6. The cleaning apparatus of claim 1, wherein part of said reactant supplier is disposed within the first cleaning chamber.

7. The cleaning apparatus of claim 1, wherein said reactant supplier

supplies a gas selected from the group consisting of ozone and oxygen into said first cleaning chamber, and comprises a gas port or a nozzle.

8. The cleaning apparatus of claim 1, wherein said aerosol-generating nozzle is disposed at an inlet where the second cleaning chamber is connected to the transfer chamber.

9. The cleaning apparatus of claim 8, wherein said aerosol-generating nozzle is disposed above said inlet so that the aerosol is jetted onto the surface of the substrate as the substrate passes below the aerosol-generating nozzle.

10. The cleaning apparatus of claim 1, wherein said aerosol-generating nozzle comprises a rod-shaped nozzle body having a plurality of orifices disposed in a row therealong.

11. The cleaning apparatus of claim 1, wherein said aerosol supplier comprises a source of argon gas, and said heat exchanger is operatively connected to said source of argon gas so as to freeze gaseous particles of the argon, whereby the particles agglomerate.

12. A cleaning apparatus comprising:

a transfer chamber into which a substrates to be cleaned is loaded;

a cleaning chamber connected to said transfer chamber so that a substrate can be transferred between said transfer chamber and said first cleaning chamber;

an aerosol supplier that supplies an aerosol into said cleaning chamber, said aerosol supplier comprising an aerosol-generating nozzle oriented to direct the aerosol onto the surface of a substrate transferred into the cleaning chamber, and a heat exchanger that freezes gas particles of the aerosol upstream of the aerosol-generating nozzle, whereby frozen particles are jetted into said cleaning chamber through said aerosol-generating nozzle to physically remove contaminants from the surface of the substrate transferred into the cleaning chamber;

a reactant supplier that supplies a fluid comprising a reactant, capable of chemically removing contaminants from the surface of the substrate, into said cleaning chamber, said reactant supplier being oriented to direct the fluid onto the surface of a substrate transferred into the first cleaning chamber; and

a laser beam generator, comprising a laser, that directs a laser beam onto the surface of a substrate transferred into the cleaning chamber to supply activation energy required to cause a chemical reaction of the reactant with contaminants on the surface of the substrate.

13. The cleaning apparatus of claim 12, wherein said aerosol-generating nozzle is disposed at an inlet where said cleaning chamber is connected to said transfer chamber.

14. The cleaning apparatus of claim 13, wherein said aerosol-generating nozzle is disposed above said inlet so that the aerosol is jetted onto the surface of the substrate as the substrate passes below the aerosol-generating nozzle.

15. The cleaning apparatus of claim 12, wherein said aerosol-generating nozzle comprises a rod-shaped nozzle body having a plurality of orifices disposed in a row therealong.

16. The cleaning apparatus of claim 12, wherein said laser beam generator and said aerosol-generating nozzle are oriented to direct the laser beam and the aerosol, respectively, at separate locations within said cleaning chamber, whereby the laser beam and the aerosol impinge discrete areas of a substrate as the substrate is transferred through said cleaning chamber.

17. The cleaning apparatus of claim 16, wherein said aerosol-generating nozzle is disposed so that the location to which the aerosol is directed within said cleaning chamber is closer to an inlet of the cleaning chamber than the location to which said laser beam is directed within said cleaning chamber.

18. The cleaning apparatus of claim 12, wherein said aerosol

supplier comprises a source of argon gas, and said heat exchanger is operatively connected to said source of argon gas so as to freeze gaseous particles of the argon, whereby the particles agglomerate.

19. The cleaning apparatus of claim 12, wherein said reactant supplier supplies a gas selected from the group consisting of ozone and oxygen into said first cleaning chamber, and comprises a gas port or a nozzle.

20. The cleaning apparatus of claim 12, wherein said laser beam generator comprises a cylindrical lens that widens the laser beam generated by said laser.

21. The cleaning apparatus of claim 12, wherein said laser beam generator is disposed outside of said cleaning chamber, and one wall of said cleaning chamber comprises a window through which the laser beam is directed into said cleaning chamber.

22. A method of removing contaminants from the surface of a substrate, said method comprising:

directing a fluid comprising a reactant, capable of chemically removing contaminants from the surface of the substrate, onto the surface of the substrate, and irradiating the surface of the substrate with light to supply activation energy that causes a chemical reaction of the reactant with

contaminants on the surface of the substrate, thereby chemically cleaning the substrate; and

jetting an aerosol comprising frozen gas particles onto the surface of the substrate to dislodge contaminants from the surface of the substrate, thereby physically cleaning the substrate,

wherein over the entire course of said irradiating the surface of the substrate and said jetting of the aerosol onto the surface of the substrate, said irradiating and said jetting are carried out in a separate manner that prevents the frozen particles of the aerosol from being evaporated by said light.

23. The method of claim 22, wherein said chemical cleaning of the substrate is performed in a first cleaning chamber, and said physical cleaning of the substrate is performed in a second cleaning chamber discrete from and connected to said first cleaning chamber.

24. The cleaning method of claim 23, wherein said irradiating the surface of the substrate with light comprises irradiating the surface of the substrate with infrared light in the first cleaning chamber.

25. The cleaning method of claim 23, wherein said irradiating the surface of the substrate with light comprises irradiating the surface of the substrate with ultraviolet light in the first cleaning chamber.

26. The cleaning method of claim 22, wherein the reactant comprises a gas selected from the group consisting of oxygen and ozone.

27. The cleaning method of claim 22, wherein said chemical cleaning of the substrate and said physical cleaning of the substrate are performed in a common cleaning chamber, and said irradiating the surface of the substrate with light comprises directing a laser beam onto a region on the surface of the substrate separate from a region on the surface at which the aerosol is directed, whereby the laser beam and the aerosol impinge discrete areas of the substrate.

28. The cleaning method of claim 22, wherein said jetting an aerosol comprising frozen gas particles comprises freezing gaseous particles of argon, whereupon the frozen argon particles agglomerate, and jetting the frozen agglomerated particles towards the surface of the substrate.

29. The cleaning method of claim 22, wherein said jetting an aerosol comprises spraying the aerosol over a width at least as great as the maximum width of the substrate, and moving the substrate relative to the aerosol until the entire surface of the substrate has been impinged by the aerosol.